भारतीय मानक
Indian Standard

IS 8789 : 2021

आई पी 2-एक्स वाली तीन फेज प्रेरण मोटरो की कार्यकारिता अभिलक्षण सम्बन्धी मान

(दूसरा पुनरीक्षण)

Values of Performance Characteristics for Three-Phase Squirrel Cage Induction Motors with Degree of Protection IP-2X

(Second Revision)

ICS 29.160.30

भारतीय मानक ब्यूरो
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September 2021 **Price Group 3**

Rotating Machinery Sectional Committee, ETD 15

FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Rotating Machinery Sectional Committee had been approved by the Electrotechnical Division Council.

This standard was first published in 1978. First revision of this standard was issued to enlarge the scope by adding 8 pole motors. The value of efficiency of motors was given replacing the earlier value of 'product of efficiency and power factor' in the Tables 1 to 8. This would permit the user to choose the motor with higher efficiency essentially as step towards specifying energy conservation features.

The second revision has been taken up to retain only SPDP squirrel cage induction motor performance with IC01 cooling. The performance for TEFC squirrel cage induction motor is now covered in IS 12615 : 2018 and hence dropped from this standard. The title of this standard has been changed to include motors with IP 21, 22 or 23 protections. The list of referred standards have been updated to include latest standards.

This standard is prepared with a view to cover the values of performance characteristics for three-phase induction motors having output rating up to 37 kW. The motor manufacturer may declare the performance characteristics of motors above 37 kW and these values are subject to tolerances specified in IS 15999 (Part 1).

The full load speed and breakaway torque values indicated in tables are nominal values.

The composition of the Committee, responsible for the formulation of this standard is given at Annex B.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

VALUES OF PERFORMANCE CHARACTERISTICS FOR THREE-PHASE SQUIRREL CAGE INDUCTION MOTORS WITH DEGREE OF PROTECTION IP-2X

(Second Revision)

1 SCOPE

This standard covers the performance characteristics of 2, 4, 6 and 8 pole three-phase squirrel cage induction motors with degree of protection IP-2X having output ratings up to and including 37 kW at rated voltage and frequency of 415 V and 50 Hz for continuous duty type S_1.

2 REFERENCE

The standards listed in Annex A contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subjected to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying most recent editions of the standards.

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 1885 (Part 35) shall apply.

4 OUTPUT RATINGS

This standard covers the values of performance characteristics for the following output ratings:

0.37, 0.55, 0.75, 1.1, 1.5, 2.2, 3.7, 5.5, 7.5, 9.3, 11, 15, 18.5, 22, 30 and 37 kW.

5 TYPE OF ENCLOSURES

The values of performance characteristics are applicable for motors having enclosures with degree of protection or IP 21, IP 22 or IP 23 (*see* IS/IEC 60034-5).

6 METHODS OF COOLING

This standard covers motors having internal and external cooling methods IC 01 (*see* IS 6362).

7 PERFORMANCE VALUES

7.1 The values of the performance characteristics of motors are covered under Tables 1 to 4 as follows:

No. of poles	*Type of Enclosures*	*Methods of Cooling*	*Table No*
2	IP 21, IP 22 or IP 23	IC 01	1
4	IP 21, IP 22 or IP 23	IC 01	2
6	IP 21, IP 22 or IP 23	IC 01	3
8	IP 21, IP 22 or IP 23	IC 01	4

NOTES

1 The values of performance characteristics specified in Tables 1 to 4 may not be applicable to motors whose minimum breakaway torque is higher than 180 percent of the full load torque.

2 The minimum breakaway torque values specified for the motor are at room temperature. The other values relating to speed, current, and efficiency apply to the motor when it has attained thermal equilibrium while delivering the rated output.

3 Test procedures for determination of the performance values shall be conducted in accordance with IS 4029.

4 The value of full load current shall be taken as the average value of the currents measured in the three phases.

5 For motors having rated voltage other than 415 V, values given in Tables 1 to 4 shall be applicable except for value of maximum full load current which would be changed in the inverse proportion of the voltage.

6 Tolerance applicable to performance parameters as per IS 15999 (Part 1).

Table 1 Values of Performance Characteristics of 2-Pole Three-Phase Squirrel Cage Induction Motors Having Enclosures with Degree of Protection IP 21, IP 22 and IP 23 and Method of Cooling IC 01

(*Clause* 7.1)

Sl No.	Rated Output	Full Load Speed	Full Load Current,	Breakaway Torque in Terms of Full Load Torque	Efficiency Nominal
	kW	rev/min	*Max* A	Percent	Percent
(1)	(2)	(3)	(4)	(5)	(6)
i)	0.37	2 720	1.20	170	63
ii)	0.55	2 760	1.60	170	67
iii)	0.75	2 780	2.00	170	71
iv)	1.1	2 790	2.80	170	73
v)	1.5	2 800	3.70	170	76
vi)	2.2	2 810	5.00	170	78
vii)	3.7	2 820	8.00	160	81
viii)	5.5	2 830	11.00	160	82
ix)	7.5	2 840	15.00	160	83
x)	9.3	2 840	19.50	160	82
xi)	11	2 860	23.50	160	83
xii)	15	2 860	31.00	160	84
xiii)	18.5	2 870	38.00	160	84.5
xiv)	22	2 870	44.00	160	85
xv)	30	2 880	57.00	160	85.5
xvi)	37	2 880	70.00	160	86

Table 2 Values of Performance Characteristics of 4-Pole Three-Phase Squirrel Cage Induction Motors Having Enclosures with Degree of Protection IP 21, IP 22 and IP 23 Method of Cooling IC 01

(*Clause* 7.1)

Sl No.	Rated Output	Full Load Speed,	Full Load Current,	Breakaway Torque in Terms of Full Load Torque,	Efficiency Nominal
	kW	rev/min	*Max* A	Percent	Percent
(1)	(2)	(3)	(4)	(5)	(6)
i)	0.37	1 330	1.40	170	64
ii)	0.55	1 340	1.70	170	69
iii)	0.75	1 360	2.20	170	71
iv)	1.1	1 370	2.90	170	73
v)	1.5	1 380	3.80	170	76
vi)	2.2	1 390	5.10	160	79
vii)	3.7	1 410	8.10	160	83
viii)	5.5	1 420	11.40	160	84
ix)	7.5	1 430	15.40	160	85
x)	9.3	1 430	19.50	160	84
xi)	11	1 430	23.00	160	84.5
xii)	15	1 430	32.00	160	85
xiii)	18.5	1 435	38.50	160	86
xiv)	22	1 440	45.00	160	86.5
xv)	30	1 440	59.00	160	87.5
xvi)	37	1 440	71.00	160	87.5

Table 3 Values of Performance Characteristics of 6-Pole Three-Phase Squirrel Cage Induction Motors Having Enclosures with Degree of Protection IP 21, IP 22 and IP 23 Method of Cooling IC 01

(*Clause* 7.1)

Sl No.	Rated Output	Full Load Speed,	Full Load Current,	Breakaway Torque in Terms of Full Load Torque,	Efficiency Nominal
	kW	rev/min	*Max* A	Percent	Percent
(1)	(2)	(3)	(4)	(5)	(6)
i)	0.37	870	1.40	160	63
ii)	0.55	870	1.90	160	65
iii)	0.75	890	2.30	160	68
iv)	1.1	900	3.20	160	71
v)	1.5	900	4.00	160	74
vi)	2.2	910	5.50	150	77
vii)	3.7	920	8.80	150	79
viii)	5.5	920	12.70	150	81
ix)	7.5	920	17.5	150	80
x)	9.3	925	22.00	140	80.5
xi)	11	925	24.0	140	83.0
xii)	15	930	32.5	140	84
xiii)	18.5	935	39.0	140	85.5
xiv)	22	940	45.0	140	86
xv)	30	945	60.0	140	86.5
xvi)	37	950	73.0	140	87

Table 4 Values of Performance Characteristics of 8-Pole Three-Phase Squirrel Cage Induction Motors Having Enclosures with Degree of Protection IP 21, IP 22 and IP 23 Method of Cooling IC 01

(*Clause* 7.1)

Sl No.	Rated Output	Full Load Speed,	Full Load Current,	Breakaway Torque in Terms of Full Load Torque,	Efficiency Nominal
	kW	rev/min	*Max* A	Percent	Percent
(1)	(2)	(3)	(4)	(5)	(6)
i)	0.37	640	1.5	150	60
ii)	0.55	640	2.1	150	65
iii)	0.75	650	2.7	150	68
iv)	1.1	660	3.5	150	70
v)	1.5	670	4.5	150	72
vi)	2.2	680	6.10	140	74
vii)	3.7	680	10	140	74
viii)	5.5	680	14.6	140	76
ix)	7.5	685	19.5	140	78
x)	9.3	690	24.0	140	79.5
xi)	11	690	27	140	81
xii)	15	695	36	140	82.5
xiii)	18.5	695	46	130	84
xiv)	22	700	53	130	85
xv)	30	700	71	130	86
xvi)	37	700	87	130	87

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
1885 (Part 35) : 1993	Electrotechnical vocabulary: Part 35 Rotating machines
4029 : 2010	Guide for testing three phase induction motors (*first revision*)
6362 : 1995	Designation of methods of cooling of rotating electric machines (*first revision*)
15999 (Part 1) : 2016/ IEC 60034-1 : 2010	Rotating electrical machines: Part 1 Rating and performance (*first revision*)
IS/IEC 60034 (Part 5) : 2000	Rotating electrical machines: Part 5 Degrees of protection provided by the integral design of rotating electrical machines (IP code) — Classification (*second revision*)

ANNEX B

(*Foreword*)

COMMITTEE COMPOSITION

Rotating Machinery Sectional Committee, ETD 15

Organization	*Representative(s)*
Bharat Heavy Electricals Limited, Bhopal	Shri Anish Varshney (***Chairman***)
ABB, Ltd, Faridabad	Shri Swapan Sarkar Shri Sumit Tyagi (*Alternate*)
All India Electrical motor Association, Gujrat	Shri Sanjay P. Jadia
Best Engineers Pumps Pvt Limited, Coimbatore	Shri J. Gowrisankar
Bureau of Energy Efficiency, New Delhi	Shri Sameer Pandita Ms Deepshikha Wadhwa (*Alternate*)
Bharat Bijlee Ltd, Mumbai	Shri Salil Kumar Mrs Anjali Ranade (*Alternate*)
Bharat Heavy Electricals Ltd, Bhopal	Shri Nisheeth Khare Shri Baboo Sonwane (*Alternate*)
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C G Power & Industrial Solutions Ltd, Mumbai	Shri A. Sudhakaran Shri Dilip Pawar (*Alternate*)
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International Copper Association Ltd, Mumbai	Shri Abhishek Dhupar Shri D. Goswami (*Alternate*)
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Integrated Electric Co (P) Ltd, Gurugram	Dr Praveen Vijayragvan
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KSB Pumps Ltd, Pune	Shri Rajesh B. Gote Shri Sanjeev Choudhary (*Alternate*)
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Organization	*Representative(s)*
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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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